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TAXATION AND LABOUR SUPPLY

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Abstract

Cross country comparisons of lifecycle labour supplies show that female hours of market work are significantly lower in Australia than in other comparable OECD countries, notably, the US, UK and Sweden. This paper argues that an explanation can be found in the rate structure of the Australian family income tax system, in combination with a poorly developed and costly childcare sector. A detailed analysis of marginal and average tax rates shows how various policy instruments are used to set rates on the income of a second earner, typically the female partner, that reduce her net wage to a level that makes it difficult to finance childcare from the additional income. The system is also shown to be unfair. The paper proposes a return to a progressive individual income tax, with universal family benefits, together with the development of a high quality, education oriented, public sector childcare system.

JEL classification: H24, J22, D91

Keywords: Income Taxes, Time Allocation, Labor Supply, Life Cycle Choices

1 Introduction

The economic approach to the evaluation of a given tax system consists of the assessment of its effects on the incentives to work, on the one hand, and on the fairness of the distribution of burdens it places on individuals and households, on the other. It is well established empirically that male labour supplies are actually not sensitive to tax rates, whereas female labour supplies are much more so.[1] Particularly important in this respect are lifecycle effects. Almost all men show over the lifecycle a stable pattern of full time employment. On the other hand, after the arrival of children the labour supply of women shows on average a substantial decline, but a high degree of heterogeneity. A large proportion of women leave the labour force when they have children under school age and, at the same time, a significant number with the same wage rates and demographic characteristics continue in full time employment. Some of those who leave rejoin later, but many remain permanently out of the labour force, continuing to specialise in domestic work. This is why discussion of the incentive effects of taxation can justifiably focus on its effects on female labour supply, since there is the potential for changes in the tax structure to have a very large effect.

The policy relevance of the relationship between tax structure and female labour supply should be clear. It is now generally acknowledged that Australia's rate of economic growth and ability to sustain public funding for health, education, and welfare will depend crucially on future labour supply and productivity. In 2005 Australia had a labour force participation rate of around 64 per cent, quite close, for example, to a UK rate of 63 per cent and a US rate of 66 per cent, but significantly below Sweden's rate of 72 per cent.

However, participation rate comparisons of this kind can seriously misrepresent labour supply variation across OECD countries because they conceal gender differences. Male rates in all four countries are relatively high, and vary in a range of only 5 percentage

[1] For a survey, see Heckman (1993).

points. Female rates are significantly lower, and differ by up to 12 percentage points.[2] More importantly, participation rates conceal the high degree of heterogeneity in female labour supply, especially among married mothers. Almost all married men are in full time work until close to retirement age. In contrast, a significant proportion of married women of working age in Australia, the US and UK are either not in the workforce or work part time. In Sweden, most work full-time. Consequently, average female hours vary quite dramatically across these countries. Hours worked by married women in Australia, the US, UK, and Sweden are, respectively, 46, 57, 62 and 75 per cent of those of married men.[3] Thus we see that Australia does not do well in terms of incentives to work.

Policies that discourage female labour supply not only have a negative effect on the earnings component of the tax base in the short term, they can also have negative lifecycle effects on human capital acquisition, and therefore on productivity, because they reduce the return to education and experience. A wide range of policies, from childcare through to in-work welfare programs, could adversely affect not just current behaviour but also the whole lifecycle pattern of work, fertility, income and saving for women.[4]

Superficially, the fairness of a tax system can be related to the degree of progressivity of its average rate structure. In this respect the Australian tax system may *appear* to rate quite highly. However, when female labour supply varies significantly across households with the same wage rates and demographics, the evaluation of the fairness of the distribution of tax burdens becomes a far more subtle issue. Is the tax burden imposed on a household determined by its total income from market labour supply? Is total market income in fact a good indicator of household well being, good enough, that is, to provide the basis for judgments on who should pay more and who should pay less? For example, is a household with young children in which both parents work full time to earn a total annual income of, say, $85,000 just as well off as another in which only one parent needs to work full time to earn the same household income? A tax system that places an equal

[2] The OECD reported male rates are 72, 70, 73 and 75 percent, and female rates, 57, 56, 59 and 69 percent, for Australia, the UK, the US and Sweden, respectively, for 2005.
[3] For data sources and further detail see Apps (2006) and Apps and Rees (2005).
[4] See Apps and Rees (2004, 2003)

burden on them is implicitly assuming that is the case. In this paper I shall argue that the Australian income tax system, defined appropriately to include the personal income tax, low income tax offset, Medicare Levy, and Family Tax Benefits Part A and Part B, is very close to one in which the tax burden is based on total household income, and that this is unfair.

A central thesis of the paper is that the marginal and average tax rate structure of the Australian income tax system is fundamentally flawed, in terms both of its incentive effects and fairness, due primarily to the withdrawal of FTBs on household income and the income of the second earner. The argument is quite straightforward - though ostensibly a system based on the progressive taxation of individual incomes, it has become a joint tax system, with very high marginal and average tax rates on married mothers as second earners across much of the distribution of earnings. This is a defining feature of joint taxation.

The paper is organized as follows. In the next section I first present lifecycle profiles of female and male labour supplies for Australia. For purposes of comparison I include profiles for Sweden, as an example of a country with a progressive individual income tax and a well-developed system of affordable childcare. Section 3 goes on to document the substantial heterogeneity in female labour supply using data for families in which at least one parent is employed. The analysis explains in some detail why household income is an unreliable measure of family living standards, and should therefore not be used as the basis for withdrawing benefits. Section 4 presents an analysis of marginal and average tax rates on primary and second earners, which makes clear the strong disincentives facing married mothers who may wish to go out to work. In Section 5, I present a simulation analysis of a reform that would make the Australian income tax system more like the Swedish system, and therefore more sustainable in an ageing population. The system is one that combines a progressive individual income tax with universal family benefits. Section 6 presents concluding comments.

2 Lifecycle labour supply

Figure 1a plots female and male labour supply profiles by age, based on weighted data means for the full sample of individual records in the Australian Bureau of Statistics (ABS) 2003-04 Survey of Income and Housing (SIH) file.[5] The figure shows graphically the gap between average female and male hours across the lifecycle, due primarily to a low rate of female full time employment. 75.3 per cent of males aged from 20 to 65 years work full time, whereas only 35.4 per cent of females across this age band are in full time employment. The profiles show a consistent rise in male hours in the early years. Female hours first rise but then fall in the early 30s, and never return to their pre-30s' level.

The shape of the female profile is obviously associated with children. To isolate the effect of children more clearly, Figure 1b presents profiles for a sub-sample that omits women under 45 in income units in which no children are present, on the assumption that they represent women who have not yet had children. Because younger women who have not had children tend to work similar hours to men, omitting them from the sample widens the gap between the male and female profiles very significantly in the first half of the lifecycle. With the arrival of children, female hours fall to around a third of male hours. From age 40+, the profiles of the two groups tend to merge because an increasing proportion of the sample begins to represent couples whose children have left home.[6] There is no matching variation in male labour supplies.[7]

A critical feature of the post-child female profile is not so much the sharp fall in hours following the arrival of the first child, and the large gap between female and male hours that this causes, but the persistence of the gap when the children reach school age and

[5] The sample includes all individual apart from a small number of hard to classify records in complex households.
[6] As indicated by the decline in the percentage of records in which children are present at around this age. See Apps and Rees (2005).
[7] The data indicate the men, with and without children, tend to work the same number of hour on average in each age group.

after they leave home. Average female hours never rise again to much above 50 per cent of male hours.

Figure 1a Labour supplies by gender

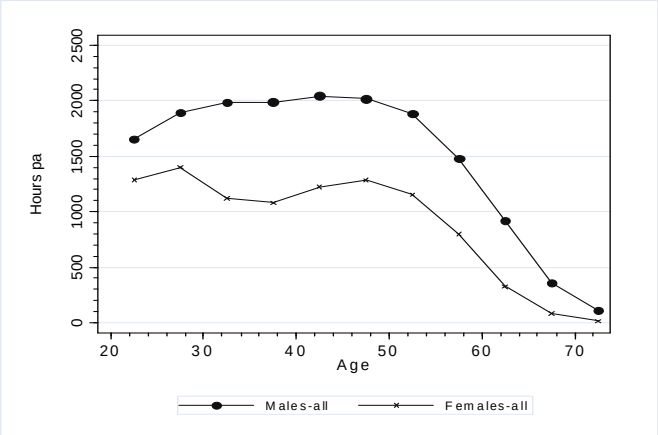
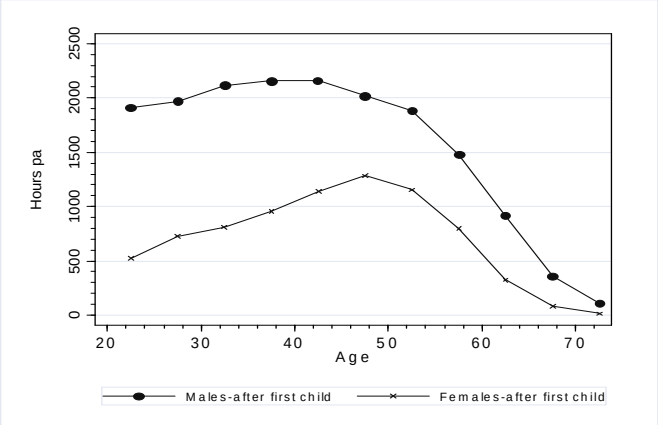


Figure 1b Post-child labour supplies by gender



Also of concern is the fact that the majority of women are either non-participants or in full-time employment, as the section to follow will show in more detail. Panel data studies, for example, those for the US where female labour supply also exhibits a high degree of heterogeneity, find strong evidence of persistence in female labour supply choices across the lifecycle,[8] and explain it as an effect of past labour supply on current wages and marginal utilities of non-market time.[9] Thus, not only does the withdrawal of

[8] A phenomenon that led Shaw (1994) to observe that: "...women tend to be either workers or non-workers".

[9] For studies estimating structural models of married women's labour force participation decision with endogenous human capital, see also Eckstein and Wolpin (1989) and Altug and Miller (1998).

married mothers from the workforce in the early child-rearing years lead to a large fall in labour supply at that time, it also causes a fall in female labour productivity which then continues to have a negative effect on female hours throughout the lifecycle. The consequences of policies that discourage mothers from working in the early years are therefore likely to be difficult to reverse for decades to come.[10]

Similar results are obtained for married couples. Figures 2a and 2b present matching profiles for the 6953 couple income units in the ABS 2003-04 SIH file. Female labour supply rises in the early years because many couples delay the first child. If we remove these records, again we find a much larger gap between female and male market hours.

Figure 2a Labour supplies of couples by gender

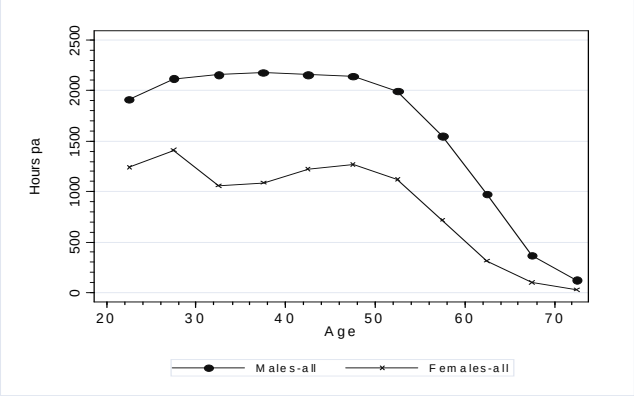
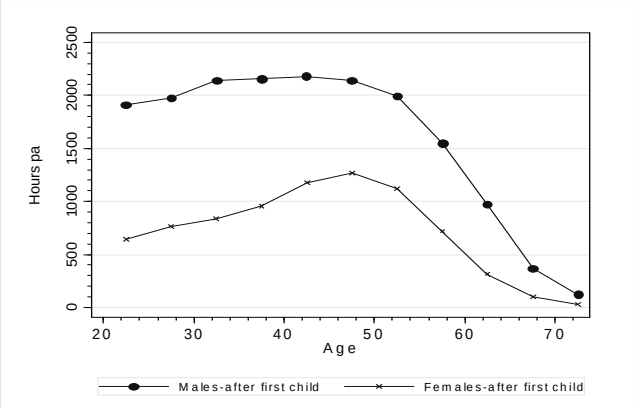


Figure 2b Post-child labour supplies of couples by gender



[10] Attanasio et al. (2003) study the lifecycle labour supply of three cohorts of American women: those born in the 1930s, 1940s and 1950s and find large shifts in the labour supply behaviour of these cohorts. Their study highlights the potential sensitivity of female labour supply to the cost of childcare.

To give an indication of the extent to which female labour supply may be driven by public policy, Figures 3a and 3b present male and female labour supply profiles of couples for Sweden,[11] a country notable for its system of individual taxation and a well developed childcare sector.

Figure 3a Sweden: Labour supplies of couples by gender

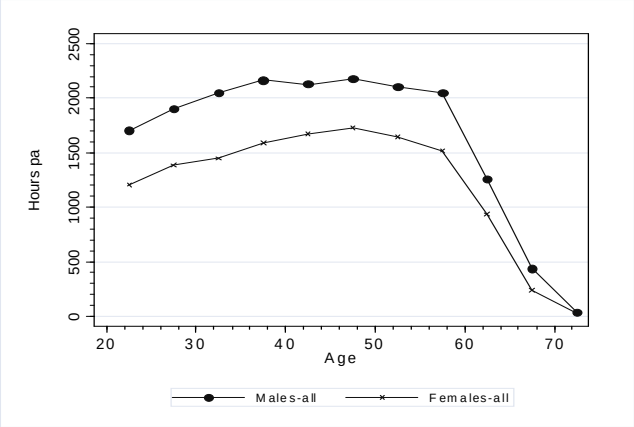
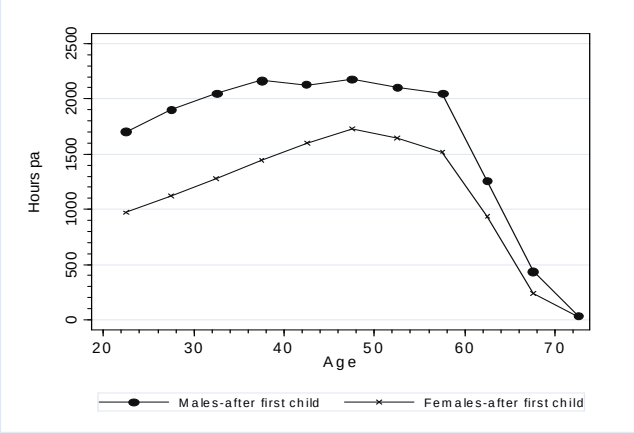


Figure 3b Sweden: Post-child labour supplies of couples by gender



The Swedish profile of female hours is, as is well known, much higher than the Australian profile. Note also that the Swedish profiles for both females and males continue at a higher level in the later phases of the lifecycle. The differences between the two countries in the pre-retirement age groups reflect the tendency towards early retirement in households in which the female partner has remained out of the workforce.

[11] For data sources and further detail, see Apps (2006).

The central proposition of this paper is that low average female hours after the arrival of the first child and the high degree of heterogeneity evident in the Australian data are due primarily to family tax policy together with the failure of successive governments to develop an efficient and affordable public sector childcare system.[12] The results presented in the sections to follow support the thesis that family tax policy has strongly inhibited the reallocation of female time to the market, during a period in which we would expect a fall in demand for domestic labour due to the fall in fertility.

3 Female labour supply heterogeneity and welfare rankings

If families with the same wage rates and demographic characteristics were observed to make the same time allocation decisions, then, all else being equal, we could reasonably expect to find a strong correlation between household income and family living standards. Under these conditions, a progressive tax on joint income would not necessarily be unfair in terms of its distribution of burdens across households. It would, of course, discriminate against the second earner, but not against two-earner households.

However, with heterogeneity in the labour supply of one parent, typically the mother, this is no longer the case. Furthermore, the problem of errors in a welfare ranking defined on household income becomes especially serious when, as the analysis to follow will show, the profile of male wage earnings for full time work is relatively flat across the middle of the distribution and then rises sharply towards the top.

The analysis draws on data for a sample of 1945 "in-work" families from the ABS 2003-04 SIH. The sample is selected on the criteria that the family is a couple income unit with dependent children and at least one parent is employed. Families in which both parents are unemployed or out of the workforce are excluded in order to focus on the personal income tax and FTB system rather than on the wider welfare system. This

[12] The negative effects on female labour supply of reducing the progressivity of the personal income tax and withdrawing benefits on family income are estimated in Apps (1991) using the parameters of a labour supply model estimated on Australian unit record data.

excludes very few records. While around 2.5 per cent of all parents in the full sample of two-parent families are unemployed, only a quarter of one per cent of families reports both parents as unemployed.[13] The sample is also limited to families in which at least one parent earns above $15,000 per annum, earnings are principally from wages and salaries, and neither parent has a negative income from investments or unincorporated enterprises. All incomes are indexed to the 2006-07 financial year.

The parent with the higher private income is defined as the "primary earner". Private income is income from all non-government sources such as wages and salaries, profits, investment income and superannuation (see ABS, 2005). The primary earner is the male partner in over 87 per cent of records in the sample and therefore in the discussion to follow the second earner will frequently be referred to as the female partner.

Table 1 reports primary and second earnings and the employment status of the second earner across a quintile ranking defined on the income of the primary earner, labelled "primary income". From the table we can see that the profile of primary hours is relatively flat, reflecting the fact that the vast majority of primary earners are male and almost all work full time. In contrast, the labour supply of second earners exhibits a very high degree of heterogeneity, with 29.7 per cent in full-time work, 36.4 per cent working part time and 33.8 per cent reporting zero hours.

Table 1 Earnings and employment status of "in-work" families, by primary income

Quintile	1	2	3	4	5	All
Primary income $pa	31004	43680	54445	67417	120055	63447
Primary earnings $pa	30739	42972	53831	65677	114523	61663
Primary labour supply, hrs pa	2094	2252	2298	2373	2527	2309
%Primary earners employed FT	84.6	94.1	94.0	97.6	96.9	93.4
Second earnings $pa	11185	17809	20560	23344	22978	19159
Second labour supply, hrs pa	887	1107	1105	1167	1001	1053
% Second earner employed PT	25.4	34.6	32.2	30.8	25.6	29.7
% Second earner employed FT	29.9	34.4	37.4	42.2	38.1	36.4

[13] Of male partners in the full sample of families, 83.6 per cent are in full-time work, 6.7 per cent are in part-time work and 2.5 per cent are unemployed. In contrast, only 27.9 per cent of married mothers are in full-time employment. 37.6 per cent are in part-time work and 2.3 per cent report being unemployed.

Table 2 presents labour supply means for the sample partitioned into three household types:

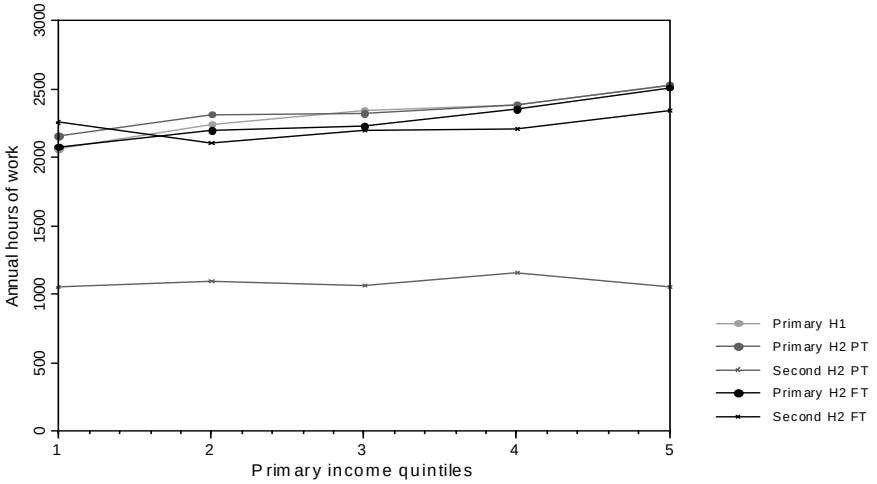
Type H1: single-earner households
Type H2 PT: two-earner households with the second earner in part-time work
Type H2 FT: two-earner households with the second earner in full-time work.

Figure 4 plots the profiles to show graphically the contrasting labour supply behaviour of primary and second earners. Since the female is the second earner in the vast majority of households, the results reflect the high degree of heterogeneity in the market hours of married mothers across the entire distribution of male earnings. The variation is, in fact, quite extreme. Married mothers employed full time work almost the same hours as males. Those employed part time work less than half the hours of males.

Table 2 Household labour supplies by primary income

Quintile	1	2	3	4	5	All
Type H1						
Primary market hours pa	2062	2240	2346	2380	2531	2296
Type H2 PT						
Primary market hours pa	2154	2315	2318	2382	2532	2351
Second market hours pa	1050	1098	1064	1155	1054	1088
Type H2 FT						
Primary market hours pa	2078	2201	2229	2354	2512	2272
Second market hours pa	2256	2104	2196	2209	2342	2231

Figure 4 Household labour supplies by primary income



In contrast to the observed diversity of female labour supply choices, time use data show that male and female *total* hours of work – market plus domestic – are, on average, closely matching (see Apps and Rees, 2005). Married mothers employed full time are found to work longer hours than their male partners, and also longer than their counterparts in the other two household types, but only in the order of 3 to 4 per cent longer. Much of the time allocated to domestic work is childcare, and so time use data provide evidence of strong substitution of household for market production by the female partner: mothers who withdraw from market work spend long hours providing childcare and related services that they would need to buy-in, or obtain though some kind of extended family arrangement, if they went out to work.

Table 3 presents the quintile profiles of primary and second earnings for each household type. Figure 5 depicts the profiles graphically. Given that there is little variation in primary hours across types, the closely matching primary income profiles indicate that male wage rates do not vary significantly across types. Thus variation in female labour supply within each quintile cannot be attributed to male wage rates. Nor can it be explained adequately by demographics. The average number of dependent children in the H1 household is 1.9, in the H2 PT household, 1.8 and in the H2 FT household, 1.7.

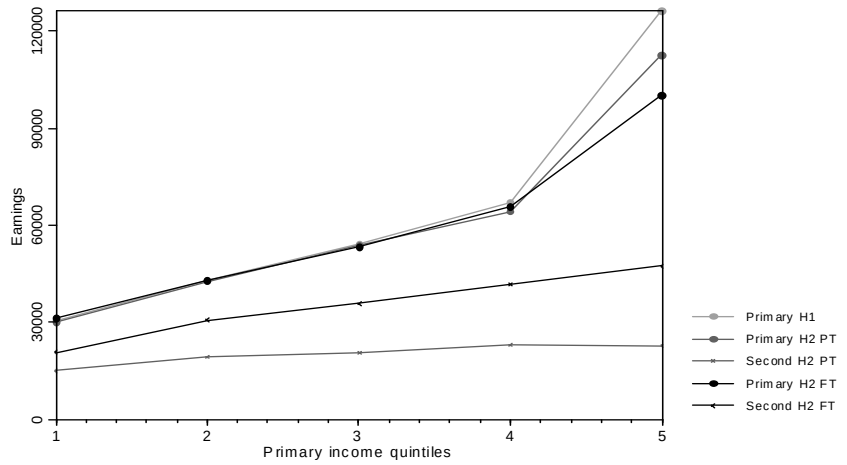
A crucial feature of the profiles of primary earnings is the relatively flat segment across quintiles 2 to 4. This means that the position of a family in a ranking defined on household income will be very sensitive to the earnings, and therefore to the labour supply, of the second earner because it will take only a small increase in earnings to shift a family from a low percentile of family income to a significantly higher point in the distribution.

This is illustrated in Table 4. The table gives the data means for household income, followed by the quintile distributions of the three household types, H1, H2 PT and H2 FT. As we would expect, the vast majority of single-earner families are ranked in the lower quintiles. The upper limit of quintile 1 is $48,620, and that of quintile 3 is $83,375. Thus a single earner family with an income of, say, $45,000 will be located in quintile 1.

Table 3 Primary and second earnings by primary income, 2006-07

Quintile	1	2	3	4	5	All
Type H1						
1. Primary earnings $pa	30744	43103	54238	67291	126591	63702
Type H2 PT						
2. Primary earnings $pa	30150	42764	53838	64392	112625	62737
3. Second earnings $pa	15121	19337	20642	22995	22890	20501
Type H2 FT						
4. Primary earnings $pa	31427	43062	53437	66027	100255	58014
5. Second earnings $pa	20861	30771	35843	41886	47441	35351

Figure 5 Primary and second earnings by h'hold type and primary income



If the family switches to Type H2 with the second earner working full time to earn, say, $40,000, the family will move from quintile 1 to quintile 4. If the household has a preschool child, much of the net second income might be spent on childcare. Clearly, such a household could not be said to have the same standard of living as another in which only one parent works full time to earn $85,000 while the other works full time at home. To argue to the contrary it is necessary to assume that home childcare makes little to no contribution to family welfare.

Table 4: Household type by household income

Quintile	1	2	3	4	5	All
Household income $pa	37020	57812	74533	94212	153711	84117
Type H1 %	67.1	43.0	23.1	15.3	21.6	33.9
Type H2 PT %	22.0	40.0	42.0	41.6	36.6	36.4
Type H2 FT %	10.9	17.0	35.0	43.1	41.8	29.7

The fundamental deficiency of a household incomes ranking is that it is defined on an income variable that omits home production, appropriately weighted by price. The ranking is driven by the labour supply of the second earner, and is therefore negatively correlated with time allocated to domestic work.

4 Family income tax system

This section compares tax burdens and marginal and average rates on individual and household incomes set by four key policy instruments of the Australian family income tax system: the personal income tax rate schedule, low income tax offset (LITO), Medicare Levy (ML), and Family Tax Benefits Part A (FTB-A) and Part B (FTB-B).[14] The analysis is based on data for the sample of in-work families described above.

Table 5, row 1 of the upper panel, reports data means for the incomes families would have if the second earner withdrew from work, by quintiles of primary income. The next row shows the average amount of *income tax*, including the LITO and ML, families would pay on that income. The third row shows their *net tax*, obtained by subtracting FTBs from the *income tax* figures in row 2. The average tax rate (ATR) in row 4 is calculated as the ratio of net tax to the average income that families would have if only one parent went out to work, expressed as a percentage. Row 1 of the lower panel gives the data means for second earnings and rows 2 to 3 report the income tax, net tax and ATRs on second earnings, calculated as the increment in tax due to the second parent going out to work.

[14] Child Care Benefit is not included. This is unlikely to alter the findings, given that the available unit record data on government direct and indirect benefits for childcare indicate that, overall, they tends to be distributed independently of employment status.

Table 5 In-work families: Tax burdens and rates, by primary income

Quintile – primary income	1	2	3	4	5	All
All households as single-earner families						
1. Family income $pa	31556	44759	55087	68775	123936	64958
2. Income tax (+LITO+ML) $pa	3395	8214	11487	15562	35662	14911
3. Net tax $pa	-7401	-1669	2929	8353	30760	6648
4. ATR %	**-23.6**	**-3.7**	**5.3**	**12.1**	**24.8**	**10.3**
Second earnings and additional tax on second earnings						
1. Second earnings $pa	11185	17809	20560	23344	22978	19159
2. Income tax (+LITO+ML) $pa	1609	2873	3434	3971	4661	3308
3. Net tax $pa	3871	6314	6538	7197	7425	6266
4. ATR on second earnings %	**34.6**	**35.4**	**31.8**	**30.8**	**32.3**	**32.7**

A striking feature of the results is the dramatic increase in the tax burden on the second earnings when FTBs are included. Comparing the income tax figures in row 2 of each panel, we can see that the share of the burden of income taxes (including the LITO and ML) on the second earnings in only 18.2 per cent. This is because the marginal tax rate (MTR) schedule of the personal income tax and LITO applies to individual incomes, and second earners typically have low incomes. The ML has little effect. However, when we include FTBs, the share rises to over 48.5 per cent.

The average net tax on family incomes is $12,914, the sum of the amount that would be payable if the second earner worked at home, $6,648, and the additional net tax payable when she goes out to work, $6,266. Thus, if all families had only one earner or, equivalently, if all second earners withdrew from market work, the average net tax per family in the sample would fall from $12,914 pa to $6,648 pa, that is, by over 48.5 per cent. The dramatic rise in the family's tax burden when the second earner goes out to work is reflected in the very high ATRs on her earnings. The overall ATR on an average income of $64,958 pa, is only 10.3 per cent. The overall ATR on second earnings, which average only $19,159, is 32.7 per cent.

ATRs on single-earner family incomes are not only low on average but also progressive. We have a negative income tax up to the second quintile, with those in quintile 1 receiving a net transfer that averages $7,401 pa. The ATR rises to 5.3 per cent in quintile

3 and then to 24.8 per cent in quintile 5. This progressive taxation of the single earner contrasts with the treatment of the second earner. The profile of ATRs on her earnings tends to be regressive, with the highest rate of 35.4 per cent in the second quintile where average earnings are only $17,809 pa.

Because the table reports average tax burdens on *all* second incomes, the figures conceal wide variation in burdens across household types. To indicate how taxes depend on the labour supply of the second earner, Table 6 presents results for the sample again partitioned into the three types: Type H1, Type H2 PT and Type H3 FT, as in Tables 2 and 3. The overall data means in the final column show that the second earner in FT work contributes almost twice as much to tax revenue as her counterpart in PT work. Thus, much of the additional revenue from second earners comes from those in FT work.

Table 6 Tax burdens, ATRs and employment status, by primary income

Quintile	**1**	**2**	**3**	**4**	**5**	**All**
Type H1						
Family income $pa	34360	46454	59317	72454	142406	70417
Net tax $pa	-7225	-2188	3245	8715	37807	7825
ATR H1 %	**-21.0**	**-4.7**	**5.5**	**12.4**	**26.5**	**11.1**
Type H2 PT						
Family income $pa	46147	64184	76065	90748	143742	86621
Second earnings $pa	15121	19337	20642	22995	22890	20501
Tax on second earnings $a	4956	7115	6692	6602	7052	6537
ATR2 H2 PT %	**32.8**	**36.8**	**32.4**	**28.7**	**30.8**	**31.9**
Net household tax $a	-2425	5612	9379	14599	36738	13723
ATRH H2 PT %	**-5.2**	**8.7**	**12.3**	**16.1**	**25.6**	**15.8**
Type H2 FT						
Family income $pa	53473	75351	90595	111271	158030	96708
Second earnings $pa	20861	30771	35843	41886	47441	35351
Tax on second earnings $a	7620	10509	11376	13536	15186	11639
ATR2 H2 FT %	**36.5**	**34.2**	**31.7**	**32.3**	**32.0**	**32.9**
Net household tax $a	1673	9787	15481	22858	40877	17739
ATRH H2 FT %	**3.1**	**13.0**	**17.0**	**20.5**	**25.9**	**18.3**

The highest ATR in the table, that of 36.8 per cent, applies to the incomes of PT second earners in quintile 2, where the average second income is less than $20,000 pa. What this means is that a married mother in quintile 2 who decides to work part time in the market rather than full time at home will, on average, earn a little less $20,000 and lose around

37 per cent in taxes and reduced FTBs. She will also contribute more to GST revenue, because her additional income will be spent at least partly on GST rated goods and services as substitutes for those she could produce herself by working full time at home.

The high tax rates on the second earner have the effect of equaliing tax burdens across single and two-earner families with the same joint income. Compare, for example, the ATRs of the FT two-earner family in quintile 2, the PT two-earner family in quintile 3 and the single earner family in quintile 4. All three have close to the same incomes, $75,351, $76,065 and $72,454, respectively, and close to the same ATRs, 13.0 per cent, 12.3 per cent and 12.4 per cent, respectively.

These results reflect the Howard Government's shift towards a system of joint taxation, through successive increases in joint and second income targeted family benefits, together with changes in personal income tax rates that reduce progressivity and therefore shift the burden towards low and average wage workers. The latter include the vast majority of employed married mothers.

Diagrammatic exposition of the structure of MTRs and ATRs

This section identifies the fundamental limitations of the rate structure of the Australian family tax system by comparing the treatment of single and two-earner families, which I now label simply Type H1 and Type H2, each with two children, one aged under 5 and the other under 12 years. Male partners in both types and the female partner in H2 are assumed to work the same full time hours in the market and the female partner in H1 to work full time at home. Both households have zero non-labour incomes.

I present MTR and ATR profiles by primary and household income, for two cases:

- Case 1: All partners face the same gross wage rate. Thus both household types have the same primary income and H2 has twice the joint income of H1.

- Case 2: The single earner in H1 has twice the gross wage rate of partners in H2, and so the two family types have the same household incomes but H2 must work twice the number of market hours as H1 to earn that income.

Case 1: H1 and H2 – tax rate profiles by primary income

Table 7 reports taxes, FTBs, and the MTRs and ATRs on primary and second incomes, as primary income rises from $31,000 to $115,000 pa in steps that are rounded figures for the quintile data means in Table 1. Row 1 in the upper panel shows net taxes, rows 2, 3 and 4, income taxes (including the LITO), ML and FTBs, respectively. Rows 5 and 6 report MTRs and ATRs for H1. The profiles can be interpreted to apply to the primary earner's income in both household types under the assumption that the household first decides on the primary earner's labour supply and then chooses the labour supply of the second partner, as implied in the preceding analysis. The subsequent rows show the tax treatment of the second earner, calculated again as the increase in the family's tax burden when the mother switches from home to market work, that is, when the Type H1 household switches to Type H2.

Table 7 Tax burdens and rates by primary income – 2-child family

Primary earnings ~ quintiles	31000	43000	54000	66000	115000
Type H1					
1. Net tax $pa	-7813	-2608	3057	9015	32108
2. Income tax (+LITO) $pa	4290	8250	11550	15150	33850
3. ML $pa	0	645	810	990	1725
4. FTB-A and FTB-B $pa	12103	11503	9303	7215	3468
5. MTR H1 %	34.0	51.1	51.1	31.5	41.5
6. ATR H1 %	-25.0	-6.1	5.7	13.7	27.9
Type H2					
7. Net tax on second earnings $pa	13088	16741	21663	23233	39042
8. Income tax (+LITO) on sec. earn. $pa	4290	8250	11550	15150	33850
9. ML on second earnings $pa	930	645	810	990	1725
10. FTB-A and FTB-B $pa	4236	3657	0	0	0
11. MTR H2 %	55.5	31.5	31.5	31.5	41.5
12. ATR2 H2 %	42.2	38.9	40.1	35.2	34.0
13. ATR H2 %	8.7	16.4	22.9	24.5	30.9

The figures for income tax in rows 2 and 8 are the same for primary and second earners in each quintile, as we would expect under an individual tax system. When the ML is included tax burdens differ in quintile 1 only, where the second earner pays an additional $930 because she not only has to pay the ML on her income but has to repay the

exemption on the primary earner's income.[15] The family's FTBs fall from $12,103 to $4236. Thus, in quintile 1, the second earner pays $4290 in income taxes, $930 ML, and loses $7,867 in FTBs. In quintile 3, FTBs of $9,303 for H1 are entirely lost by H2 when the second parent goes out to work for the same income. As a result she pays a total of $21,663 in tax, which is over 40 per cent of her earnings. Only when each parent's income is near the top of the distribution does the system begin to exhibit the rate structure of an individual tax system, with both partners paying close the same amount in net tax.

Table 8 list the MTRs that apply to primary and second incomes under the personal income MTR schedule and LITO. The LITO raises the zero rated threshold to $10,000 and the MTR on income from $25,001 to $40,000 from 30 cents to 34 cents in the dollar. The LITO is in fact an entirely redundant policy instrument that serves only to reduce the transparency of the true MTR schedule, as listed in Table 8.

Table 8 MTR schedule + LITO

Individual income tax bands	MTR (+ LITO)
$0 - $10,000	0.00
$10,001 - $25,000	0.15
$25,001 - $40,000	0.34
$40,001 - $75,000	0.30
$75,001 - $150,000	0.40
$150,000 +	0.45

The MTRs in Table 8 are depicted graphically in Figure 6a for each household type, by primary income. Since the tax base is individual income, and both partners have the same income, the graph shows a single MTR profile. This contrasts with Figure 6b, which plots the MTRs that apply to the incomes of primary and second earners when the ML and FTB system are included. The gap between profiles reflects the higher marginal rates on the second income up to the point where the base rate of FTB-A has been entirely withdrawn.

[15] A primary income of $31,000 is below the lower joint income limit of $33,435 for the ML reduction for a family with two dependent children. The upper income limit is $39,335. Because the ML reduction is withdrawn on joint income, it is partly a joint income tax.

Figure 6a MTR schedule + LITO

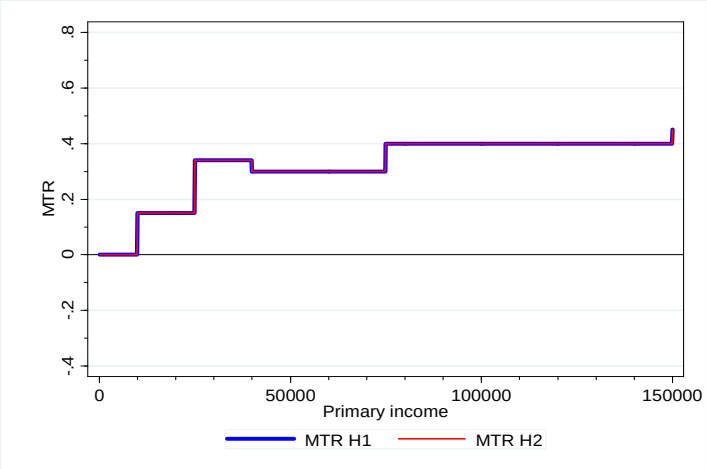


Figure 6b MTR schedule + LITO + ML + FTBs

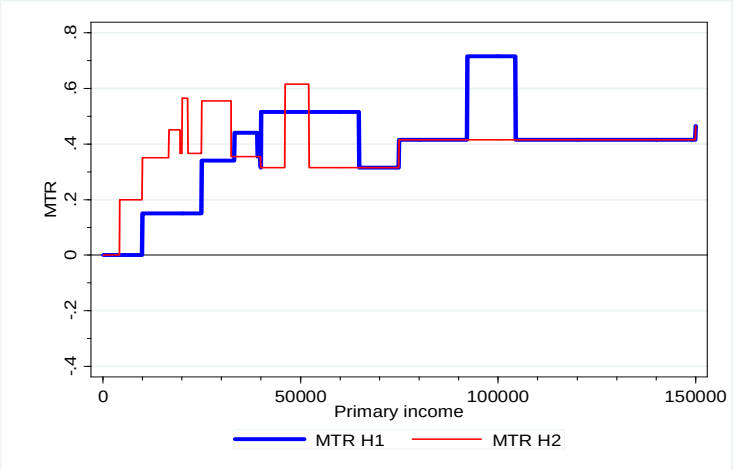


Figure 6c ATRs: MTR schedule + LITO + ML + FTBs

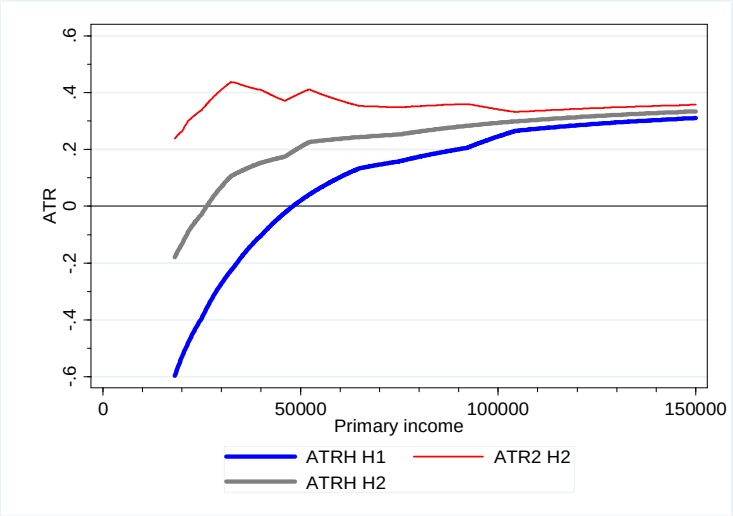


Figure 6c graphs the resulting ATR profiles. The profile for the second earner, ATR2, is well above that for the single-earner household, ATRH H1, up to around the upper income limit for the base rate of FTB-A, $104,317. As a result the ATR profile for the two-earner household, ATRH H2, is well above that of the single-earner household, ATRH H1, up to the same point. A gap of this kind between primary and second earner ATR profiles is consistent with a system of joint taxation. Taxing families on joint income, or allowing income splitting, discriminates against the second earner, by applying the MTR on the primary earner's last dollar of income to the first dollar of the second earner. And because she faces a higher MTR, she has a higher ATR. The withdrawal of FTBs on joint and second income has the same effect.

Average tax rates on the second earnings exceed 40 per cent across much of the middle of the distribution of household income. Among the more seriously disadvantaged are two-earner families with each parents earning around $52,000-$54,000 for full-time work, that is, around AWE. They pay twice as much in personal income taxes as the single-earner family also on AWE, and they are denied FTBs.

Case 2: H1 and H2 – tax profiles by household income

Table 9 presents tax burdens and rates for the two household types, as household income rises from $37,000 to $154,000 in steps that are rounded figures for the quintile data means in Table 4. Figures 7a and 7b plot the ATRs and MTRs across household income. In this case, the critical result to note is that the two household types have close to the same ATR profiles, consistent with joint taxation, from quintiles 1 to 4. The result is illustrated graphically in Figure 7b, where the very high average tax rate profile for the second earner, ATR2 H2, raises the average rate for the H2 household, ATR H2, to a level that is only slightly below that for the H1 household, ATRH H1, up to around the upper income limit of the base rate of FTB-A. In fact, at very low household income levels, the ATR for the two-earner household is slightly above that of the single-earner household, due to a higher MTR on the second income, as shown in Figure 7a. This anomaly is created by the withdrawal of FTB-B on her income alone.

Table 9 Tax burdens and tax rates by household income – 2-child family

Household income ≈ quintiles	37000	58000	75000	94000	154000
Type H1					
1. Household net tax burden $pa	-5326	5117	11850	20297	48492
2. MTR %	44.0	51.5	41.5	71.5	46.5
3. ATRH %	-14.2	8.9	15.8	21.6	31.5
Type H2					
5. Tax on second earnings $pa	4576	11548	15574	17763	26930
6. MTR %	45.0	55.5	25.5	61.5	41.5
7. ATR2 %	24.7	39.8	41.5	37.8	35.0
8. ATRH %	-16.7	5.3	14.0	18.3	25.7

Figure 7a MTRs by household income

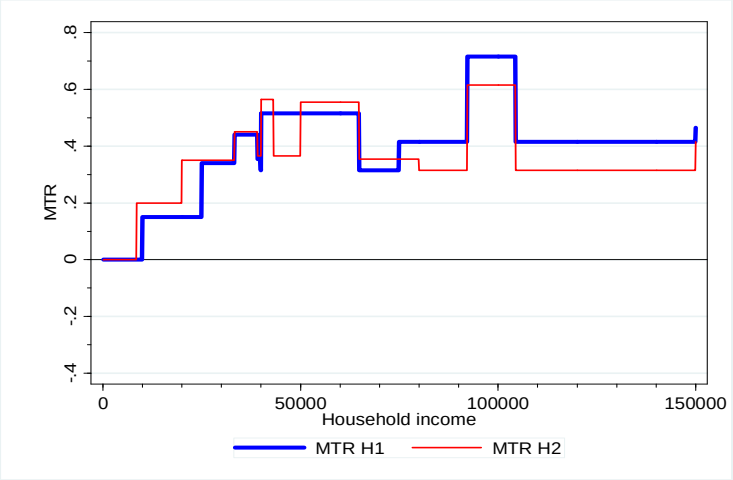
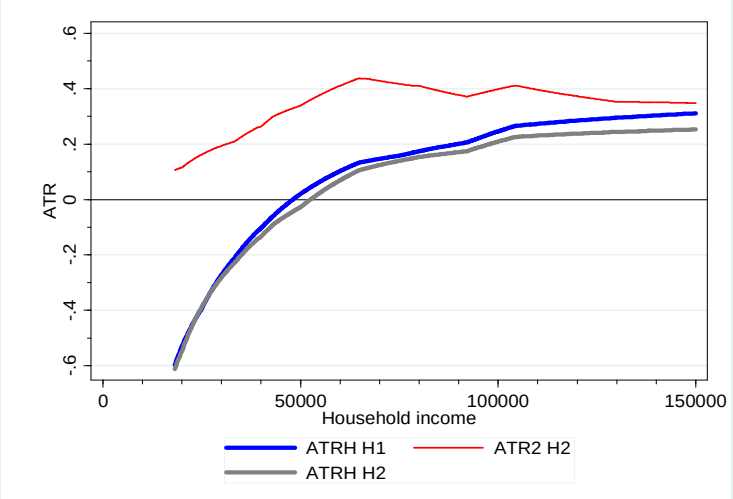


Figure 7b ATRs by household income



Equivalence to joint taxation

The preceding analysis illustrates graphically how targeting of FTBs on joint and second income transforms the Australian individual income tax into one of joint taxation of families up to around $100,000 of primary income. The system can be shown to be equivalent to one that combines universal FTBs with the joint taxation of family incomes under a rate schedule that exhibits and inverted U-shaped profile.

To demonstrate this, I take Case 1 and recalculate tax burdens and rates for a system of joint taxation under which families receive FTB-A and FTB-B as universal payments and face a new marginal rate schedule on joint income. The new schedule is listed in Table 10. The first column of the table lists the *household* income bands to which the rates apply. A key point to note is that the new MTR schedule has an inverted U-shaped profile. The highest MTR of 44 cents in the dollar applies to family incomes from $25,000 to $40,000.

Table 10 Effective joint taxation of families

Household income Tax bands	MTR
$0 - $10,000	0.00
$10,001 - $25,000	0.15
$25,001 - $40,000	0.44
$40,001 - $75,000	0.40
$75,001 - $150,000	0.40
$150,000 +	0.35

The MTR and ATR profiles are depicted graphically in Figures 8a and 8b. Note that the MTR schedule for the second earner in Figure 8a is to the left of that of the primary earner, a classic feature of joint taxation. The crucial outcome of this is that the ATR profiles in Figure 8b closely match those in Figure 6c up to around $100,000. This shows that the two systems are closely equivalent up to this income level. The result also serves to demonstrate that it makes no sense to argue that universal payments are unaffordable, since the current system is equivalent to one which has, in effect, universal family payments.

Figure 8a MTRs under joint taxation

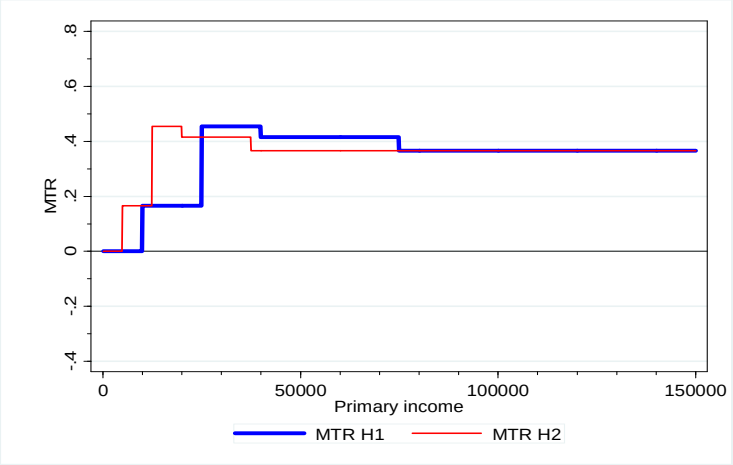
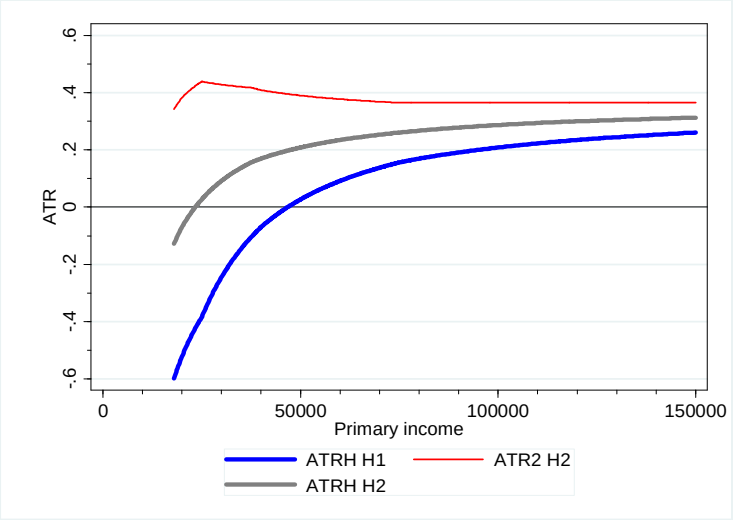


Figure 8b ATRs under joint taxation



Many studies overlook the distributional limitations of joint taxation because they fail to recognise the economic implications of female labour supply heterogeneity. The literature states consistently, and correctly, that if male labour supply is also endogenous, both partners face the same marginal rate under a system of joint taxation. It is also accepted that, in a model that treats the primary earner's labour supply as given, the MTR on the first dollar earned by a married mother as second earner is the rate applying to the last dollar earned by her husband. Thus the literature recognises that joint taxation

discriminates against married women in general.[16] However it is less well recognised that there is discrimination against the two-earner family at any given level of household income.

The deficiencies of the literature in this context can be traced to the limitations of the standard labour supply model. Under the assumptions of that model on the determinants of time use decisions – exogenous wage rates, non-labour incomes and demographics - the two household types, H1 and H2 in Case 1, cannot coexist other than as random error or as an outcome of preference heterogeneity.[17] The latter rules out welfare comparisons. However, households may have identical preferences, and the welfare of those with the same household incomes may therefore differ widely depending on factors, such as access to affordable childcare or productivity of domestic work,[18] that determine labour supply choices. These factors must be incorporated in into any labour supply or time allocation model to obtain reliable estimates of the effects of changes in policy variables.

5 Reform: progressive individual taxation

This section proposes a reform comprising a progressive individual income tax with universal family benefits and presents estimates of the additional revenue per household that would be generated if, as a result of lower tax rates, female earnings rose to around 50 per cent of male earnings. As a first round effect, that is, ignoring human capital effects on wage rates, an increase in female earnings to this level would require a rise in female hours to around 70 per cent of male hours. Note that at 70 per cent Australia would still lag behind Sweden by five percentage points. Incorporating the wage effects of gains in labour productivity, from increased work experience and incentive to invest in education, would obviously lower the required rise in female hours or, alternatively, lead to a significantly greater increase in tax revenue than the estimate reported below.

[16] See Boskin and Sheshinski (1983) and Feldstein and Feenberg (1996).
[17] See, for example, the specification of labour supply models in tax reform analysis by Blundell et al. and others. Studies using panel data specify unobserved fixed effects, following the Heckman (1981) approach. For a survey see Blundell and MaCurdy (1999).
[18] See Apps and Rees (1999a,b).

The reform combines FTB-A as a universal payment with the 2006-07 MTR schedule modified as follows. The low income tax offset is dropped and the upper income limit of the tax free threshold is lifted to $10,000. The ML is applied as a constant rate above this tax free threshold. The simulation is run on a dataset that combines the sample of 1945 families described in the preceding sections with a sample of 1604 couples without children selected from the ABS 2003-04 SIH on the same "in-work" and income criteria. Including couples without children allows for some adjustment for lifecycle effects, especially in the phases after the children have left home. Table 11 gives a summary of the results for the two samples and for all records.

Table 11 Pre- and post-reform tax burdens and rates

	Couples with children	Couples without children	All
Net household tax $pa			
Pre-reform $pa	12914	16902	14679
Post reform $pa	12638	19634	15735
Change in tax revenue/income unit $pa	-256	2732	1056
Post-reform			
Income tax on primary income $pa	14397	12471	13544
Second earnings $pa	26946	32775	29526
Income tax on second earnings $pa	6130	7650	6803
ATR on second earnings %	**21.2**	**21.7**	**21.4**

The first two rows report pre- and post-reform average net tax per household and the third row shows the net gain or loss. Overall, the reform raises additional tax revenue of $1,056 per household. Although there is a small revenue loss from families with children, this is more than offset by gains later in the lifecycle, as indicated by the results for couples without children. In the longer term the loss is unlikely to persist, as already noted. The potential for productivity gains is clear from the hours and earnings profiles in Figures 4 and 5. Both parents in the Type H2 FT household work close to the same full-time hours yet there is a large gap between their earning across the distribution, which is reflection of a significant wage gap. This gap can be expected to close over time as female labour supply rises.

The lower panel of Table 11 reports average income tax burdens on primary and second incomes. The burden on primary income in the sample of families with children is approximately the same as under the present system. The burden on the second income is significantly higher. However, second earnings rise significantly and so ATRs on post-reform second earnings are much lower, an outcome we would expect from a reform that replaces joint taxation by a progressive individual income tax. The reform changes fundamentally the MTR and ATR profiles for the two household types, as illustrated for Case 1 below.

Case 1: Tax rate profiles by primary income

Figures 9a plots the primary income profile of MTRs that apply to H1 and H2 households under the reform. There is a single profile for both types because the tax base is individual income and benefits for children are universal. Figure 9b plots the ATR profile for couples without children. The two household types face the same ATRs at any given income because they face the same MTR schedule and there are no universal benefits. This contrasts with the ATR profiles for couples with children depicted in Figure 9c. The ATR profile for H2 is above that for H1 because both household types receive the same benefit but do not contribute equally to tax revenue. The H2 household pays twice as much tax at any given level of primary income.

The contrasting profiles in Figures 9b and 9c serve to highlight again the tax policy implications of female labour supply heterogeneity. Even when the tax base is individual income, the H2 household contributes more to tax revenue at any given level of primary income. In effect, the single-earner family avoids tax on a second income by switching from taxed market work to untaxed home production and childcare. An advantage of a progressive individual income tax is that the additional tax paid by H2 is smaller than under joint taxation. This is illustrated by the wider gap between the ATR profiles for H1 and H2 in Figure 6c than in Figure 9c, up to around $100,000 where the current system tends to revert to individual taxation.

Figure 9a All couples: MTRs of reform

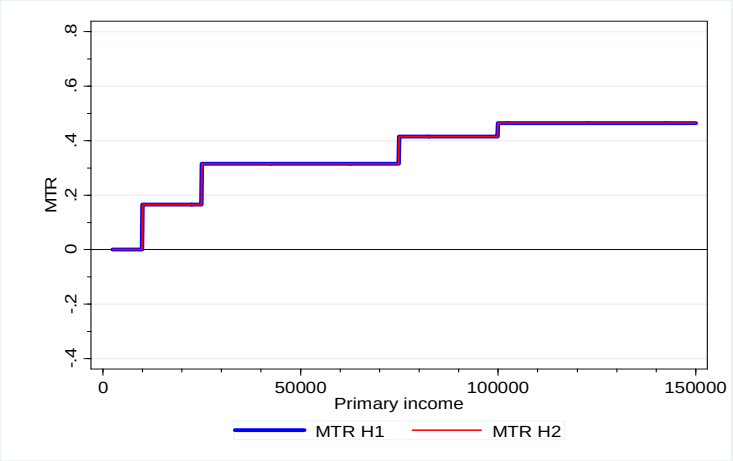


Figure 9b Couples without children: ATRs of reform

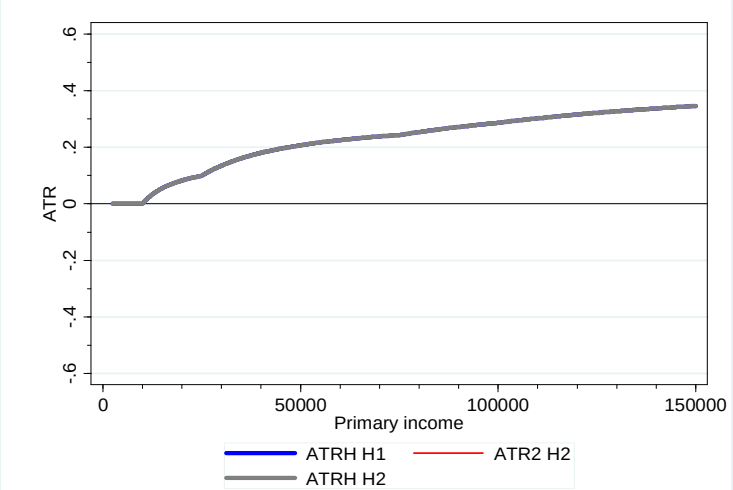
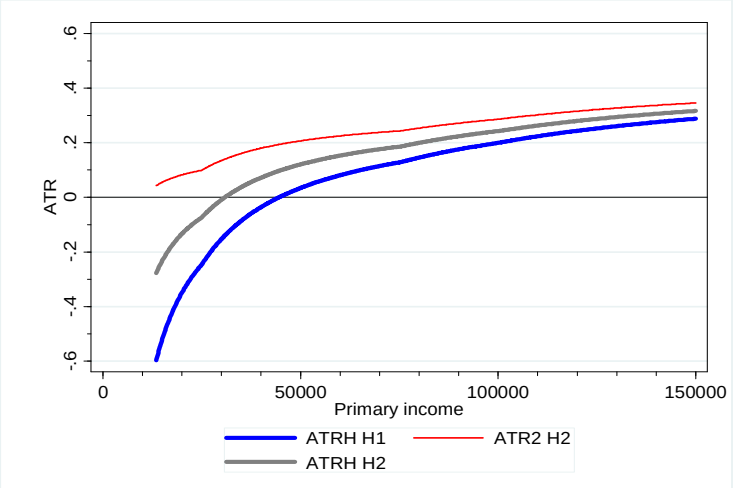


Figure 9c Couples with children: ATRs of reform



6 Concluding comment

Cross country comparisons of lifecycle labour supplies by gender show that female hours of market work, as opposed to domestic work, are significantly lower in Australia than in other comparable OECD countries, notably, the US, UK and Sweden. This paper has argued that an explanation can be found in the rate structure of the Australian family tax system, in combination with a poorly developed and costly childcare sector. The study explains how the tax system creates severe disincentives for female labour supply across much of the distribution of income, by lowering the net wage of the second earner to a level that makes it difficult to finance childcare from the additional income.

High tax rates on second earners are a characteristic of joint income taxation. In a detailed analysis of the structure of marginal and average rates I have shown how various policy instruments are used to create a system that is closely equivalent to the joint taxation of family income under a MTR schedule that exhibits an inverted U-shaped profile, combined with universal FTBs. A system of this kind is widely recognised to have strong negative effects on female labour supply and productivity, and therefore on the future tax base for funding family support.

The fundamental limitation of the system is not the level of family benefits,[19] but rather the inverted U-shaped profile of MTRs on joint income. Taxing family incomes in this way seriously inhibits the reallocation of female time from the household to the market during a period of declining fertility and therefore of falling demand for domestic labour. With population ageing, the present level of FTBs is therefore likely to become unsustainable due to productivity losses from labour supply disincentive effects.

The system was also shown to be unfair. High average tax rates on the second income ignores the fact that of two households with the same total household income, where one has the second earner working entirely in the market, the other entirely in the household,

[19] Large family benefits, as well as a high level of public investment in childcare, can be justified as a response to market failure. For further discussion see Apps and Rees (2005).

the latter will have a significantly higher standard of living because of its higher level of output of household goods and services.

The paper proposes a return to a progressive individual income tax, with universal family benefits. It also points to the need to invest in a high quality, education oriented, public sector childcare system. Such investment can, in combination with a progressive individual income tax, be expected to be more than self-financing through the expansion of the tax base and from productivity gains.

References

ABS (2005), "Survey of Income and Housing – Confidentialised File", Technical Paper 2003-04 (revise).

Altug, S and RA Miller (1998), "The Effect of Work Experience on Female Wages and Labor Supply". *Review of Economic Studies,* 65, 45-85.

Apps, PF (2006), Female Labour Supply, Taxation, and the New Discrimination, Presidential Address, XX Annual Conference of the European Society for Population Economics, Verona, June 22-24.

Apps, PF, (1991), "Tax Reform, Population Ageing and the Changing Labour Supply Behaviour of Married Women", *Journal of Population Economics*, 4(3), 201-216.

Apps, PF and R Rees, (2005), "Gender, Time Use, and Public Policy Over the Life Cycle, *Oxford Review of Economic Policy*, 21, 439-461.

Apps, PF and R Rees (2004), Fertility, Female Labour Supply and Public Policy, *Scandinavian Journal of Economics*, 106, 745-763.

Apps, PF, and R Rees, (2003), Life Cycle Time Allocation and Saving in an Imperfect Capital Market, NBER Summer Institute Session on: *Aggregate Implications of Microeconomic Consumption Behavior*, Boston, July 21-25.

Apps, PF and R Rees (1999a), "On the Taxation of Trade Within and Between Households", *Journal of Public Economics*, 73, 241-263.

Apps, PF and Rees, R. (1999b), "Individual vs. Joint Taxation in Models with Household Production", *Journal of Political Economy*, 107(2), 393-403.

Attanasio, O, H Low and V Sanchez-Marcos (2003), Explaining Changes in Female Labour Supply in a Life-Cycle Model, paper presented at the NBER Summer Institute 2003 in the session on *Aggregate Implications of Microeconomic Consumption Behavior*, Boston.

Blundell, RW and T MaCurdy (1999), "Labor Supply: A Review of Alternative Approaches", *Handbook of Labor Economics III*, North-Holland, 1560-1695.

Boskin, MJ, and E Sheshinski (1983), Optimal Tax Treatment of the Family, *Journal of Public Economics*, 20, 281-297.

Eckstein, Z and KI Wolpin (1989), "Dynamic Labor Force Participation of Married Women and Endogenous Work Experience", *Review of Economic Studies*, 56, 375-90.

Feldstein, M and DR Feenberg (1996), The Taxation of Two-Earner Families, in M Feldstein and JM Poterba (eds), *Empirical Foundations of Household Taxation*, NBER Project Report, University of Chicago Press

Heckman, JJ (1993), What Has Been Learned About Labor Supply in the Past Twenty Years?, *American Economic Review, Papers and proceedings*, 83(2), 116-121.

Heckman, J (1981), "Heterogeneity and State Dependence", in *Studies in Labor Markets*, ed. S Rosen, 91-139, University of Chicago Press, Chicago.

Shaw, K (1994), The Persistence of Female Labor Supply: Empirical Evidence and Implications, *Journal of Human Resources*, 29(2), 348-378.